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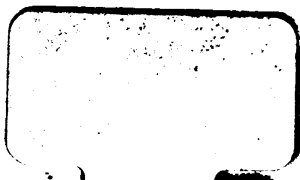


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EXERCISE AND TRAINING

THEIR EFFECTS UPON HEALTH

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PREFACE.



SINCE the publication a few months ago, in one of the weekly journals, of the remarks contained in these pages on Exercise and Training, the subject has been brought prominently before the medical profession in consequence of a discussion which took place quite recently at the Clinical Society, and which was fully reported in the 'British Medical Journal.' The results of the experience of several eminent physicians clearly stated upon this occasion have been sufficient to excite very general interest indeed in the whole subject of our athletic sports, and will undoubtedly lead to an impartial and careful examination into the question of the advantages and disadvantages which attach to them. Instances were mentioned of the serious consequences of violent muscular exertion, or 'over-

strain,' both where sudden effects were produced by it or the symptoms of disease were manifested after some lapse of time, and it was particularly interesting to observe how fairly and earnestly the discussion was supported by the Society. Not only were the usual athletic exercises most productive of injury brought under consideration, but the inquiry was extended to every kind of influence capable of exerting deleterious effects by mechanical means on the important organs of the body.

In order to make the following remarks as complete and practical as possible, I shall avail myself of the facts which were elicited on the occasion referred to and the general conclusions which may be drawn from them. It will be seen that the object in view is not to discourage a reasonable indulgence in those valuable and delightful sources of pleasure to which we are almost instinctively attached, but simply to point out how necessary it is to avoid every possibility of suffering from incaution or excess.

R. J. L.

EXERCISE AND TRAINING



CHAPTER I.

EXERCISE PHYSIOLOGICALLY CONSIDERED—ITS
PRACTICAL BENEFITS—THE INJURIES RE-
SULTING FROM OVER-EXERTION.

THE time is rapidly approaching when the value of exercise as one of the most important agents in the preservation of health and the prevention of disease will be more fully recognised than it is at present. Various active amusements, which occupy the hours of relaxation at our schools and Universities, instead of being regarded with doubt or suspicion, or looked upon more leniently as innocent pastimes, will probably before long obtain their due appreciation, and form a part of every system of rational education. Without casting any disparagement on the attention which for some years has been paid to

intellectual culture, one may raise the question whether the effects of over-care in that respect have not been quite as serious in the injuries they have produced as any which have resulted from too violent muscular exertion.

It would, however, deprive those popular amusements which demand much activity of the pleasure and advantage which may be derived from them if they were replaced by any regular gymnastic exercise; but there are certain principles which ought to be understood by all who indulge in them particularly when they submit to such rules as are in force amongst boating men at our Universities during the period of training.

It seems desirable that, instead of seizing upon opportunities for discouraging rowing and similar amusements, some attempt should be made to establish on a firm scientific basis a system of rules by which those who have not yet had experience may be guided, and the unfortunate accidents which sometimes occur to render such amusements unpopular may be avoided.

It will be seen in the course of the following remarks that every kind of movement has some particular influence on the muscles and organs of

the body, and as it makes very little difference which is selected for the purpose of illustrating the general principles on which exercise is to be regulated, we may take that which is the most popular as well as the most active.

Mr. Maclaren's work has already prepared the way for such a system as we desire to see established, and is much to be commended for its simplicity and good common sense. Every treatise on rowing necessarily includes the subject of training, and aims at a scheme or set of rules of universal application ; but there is a good deal to be done before we can arrive at general laws where great varieties of physical constitution are to be considered. This principle of variation it is of the greatest importance to recognise if we wish to examine the subject of training in a scientific manner ; and if it is fully appreciated and observed, we shall arrive at a far more satisfactory system than those which simply rest on dogmatic opinions.

To suppose that any injurious effects are produced on the constitution of a healthy man by the amount of training required for the performance of any of the exertions demanded by the sports in vogue at our Universities I have no hesitation in

asserting is an error. On the contrary, I believe that careful training is highly beneficial to health, and I think that regular boating exercise is one of the most powerful agents with which we are acquainted in preventing those serious diseases of the lungs which are liable to occur at this period of life; but it happens not unfrequently that men 'over-train,' as it is termed, and it ought to be an object of scientific enquiry to prevent the occurrence of such mistakes. Those who have had much experience in rowing will support me in the opinion that rarely, if ever, is the actual race a source of mischief to a man who has been prudent and attentive in his training. With these preliminary remarks we may enter upon our investigation.

The order in which Mr. Maclaren has taken the common agents of health—viz. exercise, diet, sleep, air, bathing, and clothing—is natural and convenient, and has been adopted by the earliest authorities on gymnastics.

'To the question, What is training, and what is it meant to do? I should answer,' says the author referred to, 'It is to put the body, with extreme and exceptional care, under the influence of all the

agents which promote its health and strength, in order to enable it to meet extreme and exceptional demands upon its energies.' This definition is a fair way of introducing the consideration of the agents mentioned, 'whether they are to be administered under or altered for purposes of training.' As the object which we have in view when we commence training is an unusual muscular exertion either soon or at a more distant period, the subject of exercise necessarily demands more attention than the other agents which are merely subsidiary to it. Let me ask rather close attention on the part of the reader to the physiology of muscular movement, for on this depends the whole question of training. By the physiology of exercise I mean chiefly the mechanical effects which muscular contraction produces on the structures of the human body. When we make any unusual muscular exertion, we discover that if only some one limb or part be involved we can support the effort until the power of the muscles in that limb or part is exhausted; but if the whole body is engaged in the exertion, the respiration may be so much disturbed as to oblige us to cease long before muscular power is exhausted. There are two conditions necessary for sustaining

muscular activity—one which relates to the muscles themselves, which we may call local ; the other to the organs chiefly of circulation and respiration, which we may term general or constitutional. In holding out a weight at arm's length we have an example of the first kind of muscular exertion ; the respiration is not disturbed to any great degree, and we can continue the effort until the power of the muscles of the arm is exhausted. To what this failure is due we shall presently examine. In running and rowing we have examples of the second class of muscular exercises, and in these, although fatigue may be felt in the muscles of the legs, the chief distress experienced is in the disturbance of the respiratory organs. It is evident from this that every kind of gymnastic exercise—indeed, every movement we make—is accompanied by local and general effects ; and we shall see that, in estimating the value of any particular kind of exercise, we must determine its influence in those respects. The development of the muscles has usually been regarded as far more important than attention to the condition of the constitution ; but this is to be attributed to the fact that we can estimate by its size the power of a muscle, while the

proof of constitutional condition (the evidence of which comes out in a race) is not so easily obtained.

The chief reason for attention to constitutional training depends on the fact that the muscles of the arms, legs, &c., are not affected in the same way as the heart and lungs by over-exertion. Voluntary muscles may be developed to twice their size, but gradually they will return, when exercise is discontinued, to their natural dimensions. With the heart and lungs it is different, and though they also are capable of increase of power, there is a limit which it is unsafe to transgress. Most of the injurious effects—I may say all—which follow excessive muscular exertion show themselves not in the production of disease of the muscles, but in some derangement of the organs of circulation and respiration.

Every kind of exercise develops certain muscles more than others, and differs from other exercises in the extent to which it disturbs circulation and respiration. Let us enquire, in the first place, into the physiological effects produced by local muscular contraction. The fatigue experienced in holding out a weight at arm's length, or in any other kind

of continued muscular effort, arises from the pressure exerted by the muscular tissue on the blood vessels which it contains. These vessels consist of arteries which supply the tissue with fresh blood, and of veins which carry the blood away in a state of impurity. The effect of pressure upon these vessels is, in the case of the arteries, to diminish or arrest the supply of blood ; in the case of the veins, to accelerate its departure ; and as the muscles depend upon arterial blood for their vitality, it is evident that sustained pressure will deprive them of their power. When the muscular contractions are of short duration, and alternate with periods of relaxation, as happens in rowing, there is no difficulty in continuing the exercise for a considerable period. The fatigue which arises from disturbance in respiration depends on a change in the quantity of blood in the lungs, heart, and large blood vessels. This takes place when many muscles are engaged in the exercise, and consequently a large quantity of arterial blood is prevented from passing into the muscular tissue, while another similar quantity of venous blood is expelled from it into the large veins connected more or less directly with the heart. In this manner muscular contraction is related to

the organs of circulation. Now beyond a certain point the heart and blood vessels are unable to support distension, and as the lungs are the organs which are most closely connected with the heart, it follows that such a disturbance as we have described soon affects their vessels likewise, and produces an arrest in the flow of blood through the tissue of the lungs. From these causes arise that distress commonly known as 'loss of wind.'

The problem of training to a great extent resolves itself into one of hydraulics; it is only complicated by the remarkable property which is possessed by the various parts of the human system of adapting themselves gradually to altered conditions. It is this fact which explains how the lungs, heart, and vessels are enabled to support considerable disturbing influences without producing discomfort or being exposed to subsequent injurious effects.

That the organs in one person differ from those in another in this power of accommodation there is no reason to doubt; and it is more than probable that from peculiarities in this respect the great difficulty is experienced of drawing up any one system of rules for training applicable to all men alike.

For the sake of those of my readers who may wish to pursue in greater detail the line of reasoning we have been following, I shall introduce some valuable remarks by a writer with whom I was personally acquainted, and to whom I feel indebted for assistance in the study of the phenomena connected with training. This author employed the terms '*musculo-cardiac*' to designate the above-mentioned effect of muscular contraction on the vessels and heart; while he applied the term '*pulmo-cardiac*' to the property possessed by the lungs of accommodating themselves to the distention of the heart and vessels. 'These observations,' says Mr. Wardrop, 'naturally lead us to enquire by what means can a person attain the power of regulating the respiratory and circulating organs, so as to be able to continue making great muscular exertions, until his muscular energy is exhausted, or in what consists the art of training? This subject has never sufficiently claimed the attention of physiologists, and no one, as far as I know, except the ingenious Mr. Bell, ever seems to have made even allusion to it, or to have considered whether any change takes place in the physical condition of the *thoracic viscera* of those who have been trained to perform feats of strength.

‘Do we not see that boxers and all the tribe of athletics cannot ever make those exertions unprepared? And what is the course of “training” but a spare diet of generous food, with regular exercise, and gradual exertions; till at last the two great functions of respiration and circulation accompanying each other are brought to the highest pitch, and the man becomes capable of exertions before impossible or dangerous, now familiar or easy to him?’

‘A careful consideration of the varied functions of respiration and circulation, along with some points but lately discovered in the anatomy of the respiratory apparatus will, I am persuaded, enable us to give a satisfactory elucidation of the changes which take place in training, and will also lead to a satisfactory explanation of several symptoms in the diseases of the *thoracic viscera* which have hitherto evaded pathological research.

‘If we attentively examine the nature of training, or putting a person “in wind,” we shall find that it consists in so regulating the respirations during muscular exertions, that any *pulmo-cardiac* congestion is prevented; and this is effected by permitting the lungs to receive only such quantities of

blood during each inspiration as will not destroy the proper adjustment between the respiratory and circulating organs, whilst at the same time a quantity of air is inspired sufficient for the arterialisation of the blood. The muscular movements are thus allowed to proceed until the energy of the muscles becomes exhausted; for, as I have already mentioned, if *pulmo-cardiac* congestion goes beyond certain limits during any muscular exertion, the person becomes exhausted, not from the muscles being fatigued, but from the cavities of the heart and pulmonary vessels becoming so loaded with blood as to interrupt respiration.

‘That *training* consists in a person acquiring a certain control over the respiratory organs, and that one of its essential conditions is to limit the *inspirations*, can be shown by examining the mode in which respiration is performed by those who are properly trained for athletic purposes.

‘It may be remarked that those who are best trained for performing feats of strength require great care and nicety in order to adjust the respiratory organs, before making any muscular exertion. The trained dancer commences his performance by increasing the movements of the body in a very

gradual manner, and thus establishes an equilibrium between the respiration and circulation, so that afterwards he can perform the most rapid movements, and continue the exertions until his muscular energy is exhausted, without suffering any interruption from the respiratory organs.

‘ It is the same with the prize-fighter, for whom, to retain his great physical powers, it is necessary that the muscular exertions which he is about to perform be at first made only in a very moderate degree ; and if, from passion or great excitement, he is induced to make too violent an effort at the commencement of a fight, the necessary adjustment in respiration is destroyed, his breathing becomes laborious, and he cannot avoid failing in his enterprise.

‘ The pernicious effects of violent exercise on the circulation, as well as the mode of avoiding them, are well understood by those who professedly train persons for gymnastic exercises, and hence it is by them considered a great nicety in the process of training never to allow *pulmo-cardiac* congestion to be carried so far as to render the *thoracic viscera* unable to recover, without difficulty, *whenever* the muscular exertions which produce the congestion

have ceased, all surplus blood from the pulmonary vessels. For when attention has not been paid to this circumstance, and when, from an over distension of the air cells, the congestion has exceeded certain limits, an embarrassment in breathing continues, which, in some instances, prevents the person from following such exercises even throughout the remainder of his life.'

The views that Mr. Wardrop entertained on training were not entirely theoretical, and it may be interesting to those who remember his name to be informed that he put them into practice with highly satisfactory results ; not indeed in training men but horses. One of the reasons why I have made so long an extract from his work is that I am anxious the attention of medical men should be directed to the subject of exercise, and its value as a therapeutic agent. We may now apply these theories to the exercise of rowing. We may consider how the *musculo-cardiac* and *pulmo-cardiac* functions are influenced by the movements of the oarsmen ; and how they are altered by strokes of various characters ; and as we prosecute these enquiries there will present themselves to our notice many other details from which satisfactory answers

will be obtained to some interesting questions often raised amongst boating men.

It is at the commencement of the stroke that the greatest strain is made on the muscular and circulating systems. All the power which the body is capable of exerting is brought to bear upon the blade of the oar. The position of the body is unfavourable for respiratory movements, and in proportion as the reach is extended so is the tension on the muscles increased. When the vertical position is attained the weight of the body is brought in to increase the pressure on the blade, or, at least, to supply the muscular force which the altered position has diminished. While the oar is at right angles with the boat, the stroke is completed by the flexor muscles of the arms, and, to assist in this action, the upper part of the chest and the shoulders are steadily fixed till the oar is clear of the water. This is a very imperfect description of the sequence of muscular actions during the stroke; but it is sufficient to distinguish two chief periods, one of greatest exertion, the other of greatest repose; the first at the commencement of the stroke, the latter at the end of it, that is before the forward movement for the following stroke begins. These periods

are more perceptible, in some styles of rowing than in others ; indeed, the style depends very much on the necessity that is experienced for repose at some particular moment, this bearing relation to the mode of distribution and amount of force previously expended. Where a crew are impressed with the advantage of catching the water at the beginning of each stroke it may be observed that it is difficult for them to avoid hanging either at the finish of that stroke or when well forward for the following one ; while a regular expenditure of force through the whole stroke diminishes the periods of repose, or at least divides the time between the finish and the commencement, so as to produce the effect of uninterrupted motion. It is simply to point out the cause of what are considered faults in rowing that I have referred to style, so that the correction of such faults may be conducted on scientific principles. The mode of distribution of force may be still left an open question for rowing authorities to decide. One of the chief objects of training is undoubtedly to regulate the powers of the circulating and respiratory organs, so as to diminish as much as possible the necessity for periods of repose,

and allow regularity of movement and equality of distribution of force.

In the remarks of Mr. Wardrop the necessity has been clearly pointed out of carefully watching lest the heart and lungs be oppressed by too hurried movements. This cannot be too strongly insisted upon, for the reason that the organs do not recover themselves very readily. For the sake of illustration, we may compare the passage of the elements of the blood through the minute vessels of the lungs to the exit of a crowd of persons from a large building. If the movement, in either case, be hurried by force beyond a certain point, it is arrested by the accidents which occur to the living particles, the vitality of which gives a character to the current very different from that of simple fluids.

The difficulty of training depends, as we have remarked, on individual peculiarities in respect to the *musculo-cardiac* and *pulmo-cardiac* functions. If the heart and lungs accommodate themselves readily to muscular contractions under ordinary circumstances, that is to say, if a man has 'good wind,' we shall probably find that the muscular system may advantageously be more fully developed ; while a naturally well-developed muscular

system will require attention to the organs of respiration and circulation. The greater number of men have both systems fairly well developed, so that in their case the object should be to increase their powers simultaneously.

I am decidedly of opinion that the training for first boat races is by no means so severe as to over-tax the powers of the majority of rowing men, and I am persuaded that they have nothing to fear if they commence training with a feeling in their own minds, the result of general experience of their own powers, that they can submit to it. If they have any doubts on the question, and allow themselves to be influenced too much by ambition, they will derive but little pleasure from making the experiment; and if they escape a break-down during training they will have the mortification of knowing that their boat is not improved by their presence in it.

The object, then, in training, is to supply strength where there is weakness; not to develop any particular part of the system at the expense of the rest, but to oppose the tendency of any one particular kind of exercise, to produce, by constant indulgence in it, that very result. At first it would

appear paradoxical to assert that constant and extensive practice in rowing is the worst preparation for a race. Such, however, is the fact, and it is equally true of every kind of exercise, mental and bodily, as it is of rowing. It must be borne in mind that the object of training is not to afford proficiency in any particular kind of exercise, but to bring those important organs and muscles which are less directly engaged in the ordinary course of the exercise into such a condition as to enable them to support an unusual effort or strain such as they are quite unaccustomed to. Thus we see the importance of variation in exercise during training. In rowing, however, we have capabilities of exercising at one time the muscular system, at another the respiratory organs, by altering the speed so that a long, slow stroke continued for some distance has the effect of increasing muscular power with little disturbance of the respiration, while a quick stroke increases the strain upon the heart and lungs. Without resorting to running as a part of a system in training, it is quite possible to obtain from rowing alone all the advantages, as far as the improvement of the respiratory organs is concerned, which any other exercise can bestow. With regard

to walking and running as auxiliaries to training, we may allow that they are useful so far as they tend to develop the muscles of the legs, and they may, therefore, be recommended to those who find that they suffer from weakness in the lower limbs during rowing ; but as means to improve respiratory power they are inferior to rowing. ' Mr. Maclaren has properly pointed out the fact that constant slow rowing produces no effect on the development of the thorax ; and he has in all probability good reasons for asserting that he ' could point to men who have had rowing for their exclusive exercise since they came to the University—men endowed with an organisation capable of the finest development—whose chests have been almost stationary for years—the years during which they should have made the greatest advancement—who have now in fact the same developments in this region which they brought from school.'

While on the subject of running, the opportunity offers itself of inquiring into the cause of the peculiar dislike which some men have to that part of training. There must be some reason for the fact that while it is no effort for one man to trot over a mile at a steady pace, and finish up with a spurt, another

has the greatest disinclination—indeed, is not equal to perform half the distance.

Many good oars suffer from the feeling to which I allude, and, as far as whose experience goes, it is doubtful whether they are benefited by the morning run or not. My own opinion on the matter is this :—Where the constitution is good, and there is no disinclination on the part of a man to run his mile before breakfast, there is no objection to his doing so; and, for some reasons, a man who can make the exertion easily is to be preferred to one who cannot, as it is undoubtedly an evidence of superior physical power, both of the muscular and respiratory systems. In the case, however, of men who feel an aversion to the morning run, the muscles of the legs may be developed by such games as fives or rackets, while the muscles of the thorax may be invigorated by half an hour in the gymnasium ; and this latter advantage running does not effect. With regard, moreover, to any violent exertion before the first meal of the day, there can be no doubt that a large number of men are only injured by attempting it. A short walk after morning chapel and before breakfast, and an hour's sharp practice in the fives court before the afternoon's row (some

time between 11 and 1 o'clock), will be found sufficient for most constitutions ; and to give especial development to the muscles of the thorax, a pair of dumb bells, a cross-bar, or, better than either, ten minutes of steady swimming, will be found a valuable addition to the particular exercise of rowing. A captain may use the test of the morning run to ascertain the constitutional character of his crew, and those who cannot run should be induced to walk, while those who can and will run should not content themselves with merely running and rowing, but should carry on such other (not excessive) exercises as are named above, and are calculated to give vigour to the frame generally and the thorax in particular. In no case is it advisable that much exercise should be undergone before breakfast.

To these general remarks on the subject of exercise in training I have nothing to add beyond this, that, every now and then, rest is better than movement, and the system will feel invigorated by a day of relaxation, and be decidedly benefited by it.

We have been considering thus far only one particular species of exercise, and before dismissing

the subject it will be proper to take a more general view of the effects of different kinds of muscular exertion on the system and their influence upon health. There is no doubt but that the importance of this agent at later periods of life is perhaps greater than in early years, and it becomes a matter of considerable difficulty to those who have indulged regularly in rowing to find a substitute for it on leaving the University. The system pursued in ancient times provided facilities which we don't enjoy in our great cities to the extent that is desirable, and almost every one engaged for many hours during the day in professional or business occupations is fully aware of the effects produced by this want. As we advance in life it is found more and more necessary to refrain from such exertions as increase too much the action of the heart and strain the organs of respiration. For this reason the most distinguished physicians have regarded no exercise as superior to that of riding, which in the opinion of the celebrated Sydenham was a cure for many maladies. It may be observed that among the Greeks the gymnasia were not originally intended for the training of athletes, that is, of those who made the agonistic and athletic art their profession.

Those who founded them had a far nobler end in view than that. Well aware of the advantages of physical power, the degree to which it contributes to the prosperity and supremacy of a nation, they took care to develop and foster a system which produced a high standard of individual muscularity. The advantages derived from riding will be clearly understood if we reflect upon the slight degree of tension of the muscles of the body, with the exception of those inside the thigh, which is required for preserving a seat on horseback, and we may place in order the various kinds of exercise with which we are acquainted according as they produce greater muscular tension, or, in a mechanical point of view, as they require the expenditure of a greater amount of force. Calculations recently made allow those much interested in the subject to estimate with considerable exactness the amount of force exerted in rowing and walking as compared with one another ; but as these calculations are not practically applicable to the human machine, owing to its complexity, I shall not detain the reader with an examination of them.

It remains for us to make some inquiry into the allegation that the exercises at our public

schools and Universities are pushed too far. In the discussion at the Clinical Society, various instances were mentioned of serious injury to the heart from overstrain. In the case of young soldiers, an irregularity of the heart might be produced by tight clothing and accoutrements, and at one of our large public schools it was observed that excessive exertion, particularly in those to some degree fatigued by mental labour, was very liable to occasion a similar disturbance. There is no doubt, with this evidence before us, which was further supported by instances of irreparable mischief, we must admit the necessity of enquiring into the particular manner in which these injuries are produced, so that the causes which occasion them may be as far as possible diminished; or where there is the least danger, decided prohibition may prevent it. For some years past, the medical profession has hardly seen its way in dealing with this difficulty; at least, I consider such attempts as have been occasionally made to interfere with the sports of our schools and Universities the very worst plan to pursue under the circumstances. It appeared to me desirable to ascertain, in the first place, the exact nature of the diseases which may be

produced by excessive exertion, and of course this could only be done by watching the cases of those who were suffering.

In this inquiry, I was fortunate in meeting with several instances of professional athletes, particularly pedestrians, who were admitted into some of our large hospitals, and, sad to say, at an early age paid the dearest penalty for their want of prudence. It became apparent that there are two distinct forms of disease which over-exercise occasions. The most serious and most striking is the sudden attack of collapse, fainting, and pain in the heart, which occurs at the very height of the strain.

Let me give an example of this which came under my notice only a few days ago:—A man twenty-three years of age stated to me that he was suffering from palpitation of the heart, and that it had been impossible for him to do anything for more than a year. The slightest exertion—for instance, simply going up-stairs—occasioned great distress, and even in walking he was obliged to move very slowly and regularly. The whole of this condition followed a two hundred yards' race, in which he had suddenly been seized, while running at full speed, with such intense pain in the heart

and faintness that he fell almost insensible. From that time he had been under various kinds of treatment, but had never recovered. The further details of the case will be published elsewhere.

Such is the common form which the disease of the heart assumes, and which is to be referred to an injury of its valves, or more commonly, to violent separation of the muscular fibres of the walls of the cavities of the heart. The other form is the result of long-continued exercise ; and though both these diseases are essentially characterised by simple hypertrophy of the heart, the causes are different.

Later in life not only the heart is affected but the arteries as well, and what is termed atheroma, or degeneration of the walls of the vessels, is a common disease. In the cases, however, which I have examined of immense hypertrophy of the heart in professional pedestrians, that condition was not often present. And I am inclined to agree with my friend Dr. Reginald Thompson, who was a distinguished oarsman at Cambridge, in the explanation that he gives of the origin of the disease which he has called *distrain* of the heart. For practical purposes it is

sufficient to know that a sudden strain on the heart, particularly if the person is not in training—and here the great advantages of training are apparent—may be the cause of fatal disease. The loss of blood from the lungs which may occur is the natural relief to the state of tension. There is also the important fact to be well acquainted with, that long-continued muscular exertion, though it may be only in making steady Alpine ascents or walking over the moors, will, if pursued too assiduously, be productive of disease of the heart. In daily life we may be required at any moment to make an exertion which, if we are unprepared for, may be injurious, not indeed to the same extent as in the cases we have been considering, but quite sufficient to produce discomfort. I would conclude this chapter, therefore, with the advice that every man should keep himself in such health as to be prepared to bear the strains of ordinary life with indifference; and though he may not care to be an athlete, he will perceive the salutary object which athletes have in view in training.

CHAPTER II.

DIET—SLEEP—AIR—BATHING—CLOTHING—MODE OF TRAINING—MEDICAL TREATMENT.

ON the vexed question of diet I have but little to say, not because the subject is simple in its principles or unimportant in its details, but because it is far more easy to dictate to the stomach than to make it obey. It may be asked by the reader whether the results of careful chemical examinations of different kinds of food cannot be applied with advantage to the subject of diet in training. There is no doubt that they may be useful for general purposes, but I have not found that they meet the requirements of individual peculiarities of constitution. In making use of the results of chemical analysis in the choice of any kind of diet, it is absolutely necessary to determine the value of any particular article by direct experiment. To choose what is best for the nourishment of any individual,

and what is most easily assimilated, is impossible without individual observation. If I ventured upon any remark it would be this, that, within the limits of sense, the sensations of each individual, in regard to any particular kind of food, are a better guide than the dogmatic injunctions of others. The best plan would be to determine what are innocent kinds of food, and allow considerable liberty in choice within this limit both as to quantity and character. The ordinary kinds of meat, fish, and vegetables, cooked plainly but as artistically as possible, may all be permitted, while a certain amount of fresh fruit will do no one any harm. It will be the best plan, however, to have some system to follow, one which will be sufficiently general to suit the majority of rowing men and exact enough for all practical purposes. In a note appended to these remarks, the reader will find such a system as appears to me, after careful consideration, to answer these requisitions. The most important question to consider is the value and necessity of wine and other stimulants or additions. There is but little probability of excess being committed in good simple food, or in fluids such as milk and water. These may be freely indulged in.

But in the matter of wine, the time of year, the atmosphere of the place, and the constitution of the individual, must all be considered. The fluids of the body, owing to the effect of muscular contraction on the blood vessels, as described above, are liable to considerable variations in quantity. The chief loss in weight observable at the commencement of training is due to diminution in the quantity of blood, and probably to an alteration in its character as well ; and it is by these means that the blood vessels are relieved of the tension that would otherwise be caused by muscular contraction. It is, of course, by perspiration that this is effected, and it is difficult for any but a student of physiology to form an adequate conception of the power possessed by the skin, that is, by its minute blood vessels and capillaries, of accommodating themselves to the pressure resulting from over distension of the deeper arteries and veins.

As an example of the loss which may be occasioned by suddenly commencing training, I remember that a College friend, who was requested to take an oar, some years ago, in the Cambridge University boat, shortly before it came up to

Putney, informed me that he lost a stone weight in two days—seven pounds each day.

We ought to endeavour, therefore, to choose food and fluids which are known to improve the condition of the blood, if there is any appearance of weakness and loss of colour in training.

I have considered the advantage of introducing tables of the nutritious elements of different kinds of food at the conclusion of these remarks, but am convinced that, interesting as they may be to the physiologist or physician, to the general reader they would really be of but little practical use, and this for the reason that we meet with such a variation in constitutional conditions as to render it impossible to draw up an exact code of rules.

Though beef, mutton, beer, water, and tea may be very excellent things in their way, and the best to be limited to if they agree well with one's physical peculiarities, yet now and then most valuable assistance may be obtained for the improvement of the system by a certain quantity of alcoholic stimulant, such as port wine or half a pint of dry champagne. Let not the reader imagine that this would ever be requisite in a more bracing climate than that of Cambridge or Oxford. My remarks on this

point are intended for adoption only at the Universities, and they are addressed to those alone who find that training brings them down in weight and energy so much as to make the process quite disagreeable. There is but little necessity to watch some members of a crew, for their looks are sufficient evidence of robust health; but where that condition known as over training threatens to come on, rest and port wine will do wonders. At dinner-time I would recommend that small eaters should be allowed a light wine, such as hock or claret, instead of beer. The training table will be much improved by attention to such details, and the monotony of training, which produces in some men a dislike of food, will be greatly relieved. Under all circumstances, if wine is taken at all, it is better that it should be taken at meal-times. In cold weather the food and fluids may generally be more stimulating than in the summer.

If we now take the other points which are to be attended to in training, viz., sleep, air, bathing, and clothing, and examine their physiological action on the body under ordinary circumstances, it will not be difficult to decide upon the extent to which they must be modified for training purposes.

It is important to distinguish between sleep and rest, for it is one thing to lie in bed for seven hours and sleep calmly and uninterrupted, and another thing if slumber is disturbed, and a certain amount of rest is substituted for sleep. It should be a rule that no attempt should ever be made to wake a man in training at any fixed hour. The duration of sleep must be left entirely to the demands of the system, and should not be interrupted, however long it may continue. Whether the number of hours of sleep should be six, seven, or eight, is not the question for us to decide. If the captain of a boat can secure seven hours' sound sleep for each of his crew, or even six hours, he may feel well satisfied. The real difficulty experienced in training is in obtaining true sleep. Whether rest will compensate for sleep or not is a different question, and a very important one to consider. Experience teaches us that digestion is one of the vital processes that is not effected during sleep as it is when the body is simply in repose, while exercise interferes with, if it does not entirely arrest it. We may therefore regard rest as the period when the assimilation of food goes on most satisfactorily, and so far a certain amount of rest is necessary for that process.

The reparation of the tissues resembles very closely the process of respiration in this respect, that it continues more or less constantly during the whole twenty-four hours, more actively, perhaps, at one time than another; but not like digestion in a periodic manner. The influence of sleep and rest may be better ascertained by observing the effects that result from the interruption or diminution of them, both when exercise is increased and when it is diminished. Those who have sat for many hours in the sick room are well acquainted with the feeling produced simply by want of sleep, and may compare it with the different sensation which is experienced during long-sustained muscular exercise, as, for instance, during high mountain ascents. In the former case the very want of exercise seems to preclude satisfactory sleep, while in the latter it is difficult to oppose the strong desire to yield to it. It would appear from this that rest to a certain extent must be looked upon as opposed to sleep; at all events, in training we must not regard it as an efficient substitute for sleep.

When seven hours is recommended as the limit of time to be spent in bed, it is assumed that sleep is continuous during the whole of the time. If

only five or six out of the seven hours are thus spent, it will be better to resort to exercise to induce sleep than to prolong the hours of rest. So far the rule of seven hours is to be recommended ; for, supposing that it is impossible to obtain more than five hours' sleep on one night, it is almost certain that the deficiency will be made up the night following. There is a wide difference, however, in the readiness with which some can compose themselves for sleep when compared with others, or can sustain the want of it. Some, again, are of such a disposition of mind as to be influenced easily by exciting causes, which seriously interfere with sound repose and sleep. By observing regularity in the time of retiring to bed and leaving it in the morning, the habit may be induced of sleeping soundly enough during the seven hours for all requirements ; but till this habit is induced it will be wise to compensate for a short sleep one night by retiring an hour or two earlier the following night, particularly if the disturbance occurs during the racing week. A captain will do well to urge on the attention of his crew the desirability of leaving bed at a certain fixed hour in the morning while in training. If any man likes to go to bed early it may be permitted

him to do so, or if he likes to rise earlier than the fixed time no objection should be made. The best general plan to pursue is to discourage any indulgence in rest in bed, unless in sleep, and to advise each man to get up as soon as he wakes, whether he has had seven hours' sleep or not. It will be better if fatigue is felt to rest during the day rather than during the proper hours of sleep.

On the subject of air little need be said. The necessity of ventilation in the bedroom is rightly insisted upon by Mr. Maclaren, and the plan of leaving the window open at all seasons is decidedly to be recommended.

As I have already referred to the condition produced by over-training, in the same way that an extra allowance of stimulant is beneficial, I would advise a change of air for a day or two from the University to the sea coast, or at least to a more bracing atmosphere. A visit to the Newmarket hills would afford sufficient change probably for Cambridge men, but the sea air is undoubtedly to be preferred. It may be observed, however, that rowing men suffer much less than others from the peculiarly depressing influence of the atmosphere which characterises both Universities, and probably

this results from the regularity with which exercise of some kind is pursued. Those who have resided for some years in the neighbourhood of Oxford and Cambridge not only are free from the inconvenience of suffering from the influence of the atmosphere but are disagreeably affected by more bracing climates.

It is unnecessary to make any general remarks on the beneficial effects of bathing, as the cold bath has become essential to the comfort of most men at the Universities, and every one has some experience of its use. It will be interesting, nevertheless, to examine the physiological action which is produced by the application of water at different temperatures to the surface of the body, and this for the reason that it produces different effects on different individuals. Occasionally, though rarely, we meet with those who are unable to take a bath regularly without suffering at times from the influence of cold for an hour or more after it, while others pursue, with a certain sense of satisfaction, the plan of bathing all the year round in water fresh from the spring, and therefore much colder in winter than in summer.

The physiological effect of the cold bath is to

produce a sudden contraction of the minute blood vessels of the skin ; a similar condition in fact, to that which muscular contraction produces on the vessels of muscular tissue. The property which the cutaneous vessels possess of accommodating themselves to any distension of the deeper vessels, to which I have already alluded, must be considered when we desire to develop it as an auxiliary in training. There can be no doubt that in the cold bath and the hot bath we are provided with the best means of regulating the amount of blood in the cutaneous system of vessels. When the latter is used, there follows relief to the larger and deeper vessels, and when the former the opposite condition is the result. After active exercise, the cutaneous vessels are unusually distended with blood, and, in order to restore equilibrium, a cold bath or douche may be used with propriety. It is quite possible, however, to carry to excess the use of the cold bath early in the morning, for cutaneous distension is not by any means a consequence of sleep, and to apply to the skin water uncomfortably cold is to commit the same kind of fault as attempting to make active muscular efforts early in the morning. Let me recommend the bath with this limitation : that in

summer and winter the temperature shall be preserved the same, and that, under no circumstances, shall the water in winter be used colder than in summer. The consideration of the effect of the cold bath in producing what is termed a shock would necessitate the introduction of some reference to the nervous system, which I have hitherto purposely kept out of view, as it has appeared desirable to limit our inquiry as much as possible to changes in the system arising from mechanical causes ; and as there is no decided benefit, as far as I can judge, from using cold water, with the view of producing such a shock as is referred to, I shall not enter into that part of the question. There can be no doubt that the contracting effect of cold on the surface vessels must produce a considerable change in the quantity of blood in the heart and lungs ; in fact, a sudden congestion. As it is not our object in training to prepare those organs for any extremely sudden change of this kind, we may inquire whether the chief benefit of the bath may not arise from its effect on the minute vessels in strengthening their contractile power, popularly known as giving tone to them, so that a strain during violent exertion may be better sustained. For practical purposes I

would advise that the cold bath be used very soon after rowing, while the body is warm and perspiring. In the early morning the tepid bath should be used if the cold bath is disagreeable or produces a chill not quickly recovered from. It would be desirable for every boat-house to be supplied with greater facilities than were enjoyed when I was at Cambridge of obtaining a cold douche. It would be quite easy to arrange a row of douche baths, so that a shower of water might be allowed to fall on the body immediately after getting out of the boat ; and I would suggest that, instead of running home in the boating clothes, the dress should be changed in the boat-house. In particular cases I should recommend in the morning that a warm bath be taken on leaving bed, the skin well rubbed, and that a cold douche be taken immediately afterwards. This plan will be found superior to any other. Let me say one word on the use of the cold bath. It is my belief that the habit of bathing winter and summer in a running stream, or in water of low temperature is highly injurious, and that, instead of preserving the health for a number of years, it will induce premature disease of the heart and arteries,

even in those of the strongest constitutions. With regard to the Turkish bath, I shall say nothing, as all the effect obtained from it I believe may be gained by muscular exercise, which is sufficient in itself to develop those functions of the skin which are stimulated by the Turkish bath. The variable effects of the cold bath on different individuals depend on the functional activity of the vascular system, that is, on the readiness with which the vessels accommodate themselves to changes in the quantity of fluid they contain and return to their normal degree of distension.

The usual boating dress is admirably suited in every way for the freedom of movement which is required in rowing. The chief point demanding attention is the prevention of cold soon after the exercise, and, though a thick pilot coat is commonly used, it is so important a part of boating dress that I may be allowed to advise that no one should be without it.

If the object of the rather discursive remarks which I have made had been to introduce an entirely new system of training, or if the subject had not already received some attention, it would have been incumbent on me to give exact directions instead

of attempting to point out what appear to be some of the chief deficiencies in other systems.

On carefully examining the systems of instructions which are appended to Mr. Maclaren's work, it is apparent that each has merits of its own, and that it is less necessary to direct the attention of readers to those particulars which are the same in each system than to examine the details in which they differ. I would prefer, however, to leave the reader to do this for himself, as experience will assist him in arriving at conclusions best suited to his individual requirements.

For general purposes, I would recommend the system of the late H. Clasper, as it is more simple than the others quoted by Mr. Maclaren, and appears to be founded upon personal observation. Sufficient regard has not been paid in any of these regulations to the prevention or amelioration of that uncomfortable condition which is known as over-training. The occurrence of boils alone, to which rowing men are very subject, is a source of much disturbance of the system, interfering with the exercise itself, and producing constitutional effects, as well as more or less local pain. There are also liabilities to serious inconvenience from inflammation of the tissues of

the palms of the hands, so painful sometimes as to prevent sleep, and occasionally to require surgical relief. The friction of the handle of the oar, combined with the pressure of the grasp, might occasion inflammation in the deep tendinous and fibrous structures of the hands in a person in robust health, but there is no doubt that the depressing influence of training on some constitutions very much increases the tendency to this occurrence.

[It is, therefore, highly important that whenever a man in training begins to suffer from loss of appetite and healthy looks, and a feeling of lassitude which neither sleep nor rest seems to remove, some active measures should be taken to restore the condition of the system. To continue training under such circumstances is injudicious in every way, and will defeat the end in view. I would strongly recommend a man in such a state to leave the University for two or three days and go to a bracing air, to get a sea bath if possible, and take only as much exercise as he feels inclined for. The change, the rest, and a dose or two of some simple purgative, with an extra allowance of port wine, will generally restore him to his usual vigour. Some men pass through this stage of depression

and recover without taking any active measures, but if it does not pass off in a few days, and if the races are close at hand, it will be far better, for the sake of the boat, to follow the plan I have advised. If some think that I am recommending a too stimulating diet, they must remember that I do not intend my remarks to apply to other localities than the two Universities, though I would give the same advice under whatever circumstances this condition of the system might be produced, as personal observation and theoretical considerations combine to assure me of its propriety.

It only remains for me to say a few words on medical treatment. Some might think it wisest to give a caution against self-doctoring, and where any serious injury is sustained by over-exertion, I would support such advice. We may refer the slightest forms of disturbance of the circulation, such as irregularity of the heart, palpitation, &c., which are felt by most persons after any kind of unusual exertion to the congestion and excitement which the heart has been subjected to, and this may be so distressing as to produce considerable alarm by preventing sleep, disturbing the brain, or giving rise to an uneasiness difficult to describe to

those who have not experienced it. A hot bath, a good dose of antimony, from three to five grains of antimonial powder, or half a drachm of antimonial wine, with a grain or two of calomel, will soon relieve this condition. There are two other remedies, bromide of potassium and digitalis, of great value in reducing the excitement, but the latter remedy is not so efficient as the preparations of conium, henbane, and belladonna. I must go no farther than to advise the application of three or four leeches to the region of the heart, a remedy more efficacious than all medical remedies. Those serious diseases to which I have alluded require the most careful consideration of the medical attendant, and cannot be discussed in these pages.

I would recommend most men who fall off in training to take some preparation of quinine and iron as a tonic till the system becomes accustomed to the exercise. Every man at the Universities has plenty of time to decide whether he ought to continue training or not for the races, and I would insist strongly, if he has any doubt whatever in his own mind about it, either to give it up, or to take proper advice before he pledges himself to his boat.

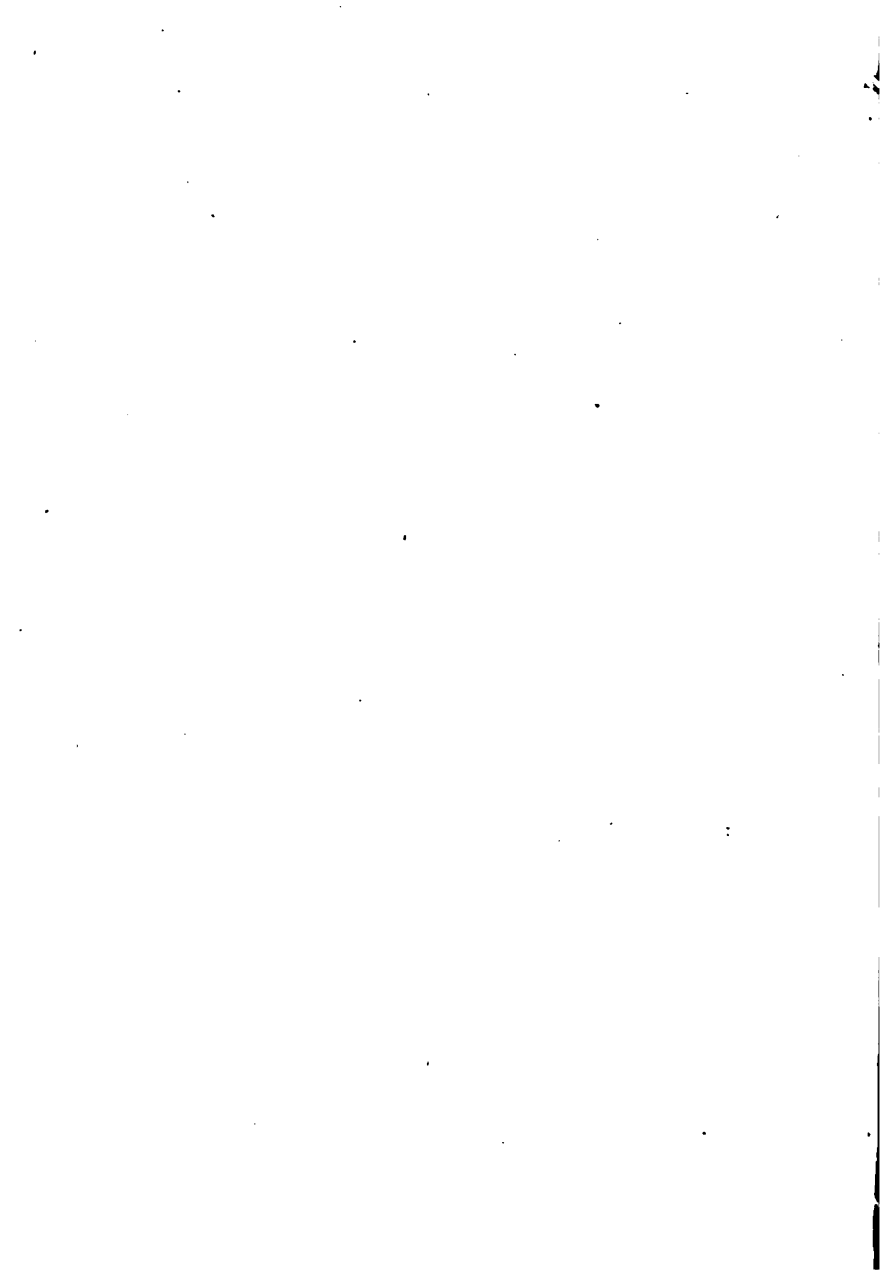
It is not at all improbable that the opponents of systematic exercise—that is to say, those who consider the slightest attention to the wants of the body as below the dignity of a reflecting mind—will find in what I have written much to employ in support of their views. If they will be good enough to restore the world to a state of primeval simplicity, and destroy all the bad influences engendered by high civilisation on the healthy natural development of the body, their sons will find in toil the proper source of exercise; and the word ‘training,’ which has been so often repeated in these remarks, with the far from agreeable ideas which the uninitiated associate with it, will no longer exist in our language as applied to the human species. Proud as parents may feel of mental superiority in their sons, it is well to remind them of the debt which they owe to the exercises of our Universities for that remarkably rapid development which a term or two of Oxford or Cambridge life produces in nearly all who enter them.

It is difficult to estimate the influence derived from this important element in University education on the physical and moral character. Few persons realize its value in this respect, and far from dis-

couraging rational indulgence in exercise, and particularly in rowing, it ought to be the desire of all who are interested in the welfare of any institution for education to promote as far as possible the cultivation of the qualities developed by systematic exercise, as they are valuable agents in training men to habits of endurance and energy, and in preparing them to perform in after life the duties of active and useful members of society.

That the sound mind requires a sound body for its shelter is a proverb older than the English language. That it is eminently difficult for a man suffering from bodily infirmity to be active and amiable is obvious. That bodily health, and, as a consequence, mental vigour, are promoted by judicious and wisely directed exercise, is beyond dispute. The reverse holds no less true that over-exertion or exercise at improper times, under ill-chosen circumstances, and carried to excess, injures the body and obstructs mental action. Surely, then, 'training' or prudent and systematic exercise of the body, with a view to keeping the mind clear and elastic, must be virtuous and good ; and it is in this persuasion that I have endeavoured in the

foregoing pages to admonish against errors in training, and to recommend the true principles which should guide men in bringing about that blissful condition of existence, the *mens sana in corpore sano*.



GENERAL SYSTEM FOR TRAINING.

(1) To suit 5 o'clock hall :

Rise at 7 A.M., earlier if awake. Sleep not to be disturbed.

Tepid bath—*i.e.* between 60° and 70° temp.—or a warm bath followed by a cold douche.

Half a tumbler of warm milk-and-water and a slice of stale bread or toast.

Exercise till 8.30 A.M. Walking briskly or running slowly.

Breakfast. A mutton-chop, steak, or cold fowl, with one boiled egg; stale bread or toast, butter, tea, sugar, and milk.

Exercise from 12 A.M. to 1 P.M. Fives, racket, gymnasium, or steady paddling.

Lunch at 1.15 P.M. A small basin of mutton broth with barley, or cold rice pudding, and a glass of sherry or claret with water, or a small glass of beer, if preferred; a glass of port wine if near the time of races.

Exercise, 2.15 P.M. to 4 P.M., rowing. Slow steady stroke for first half-hour, varied afterwards, slow, steady, and continuous for the last half-mile or so.

Cold bath immediately after rowing, dry and warm clothes, and a quiet walk.

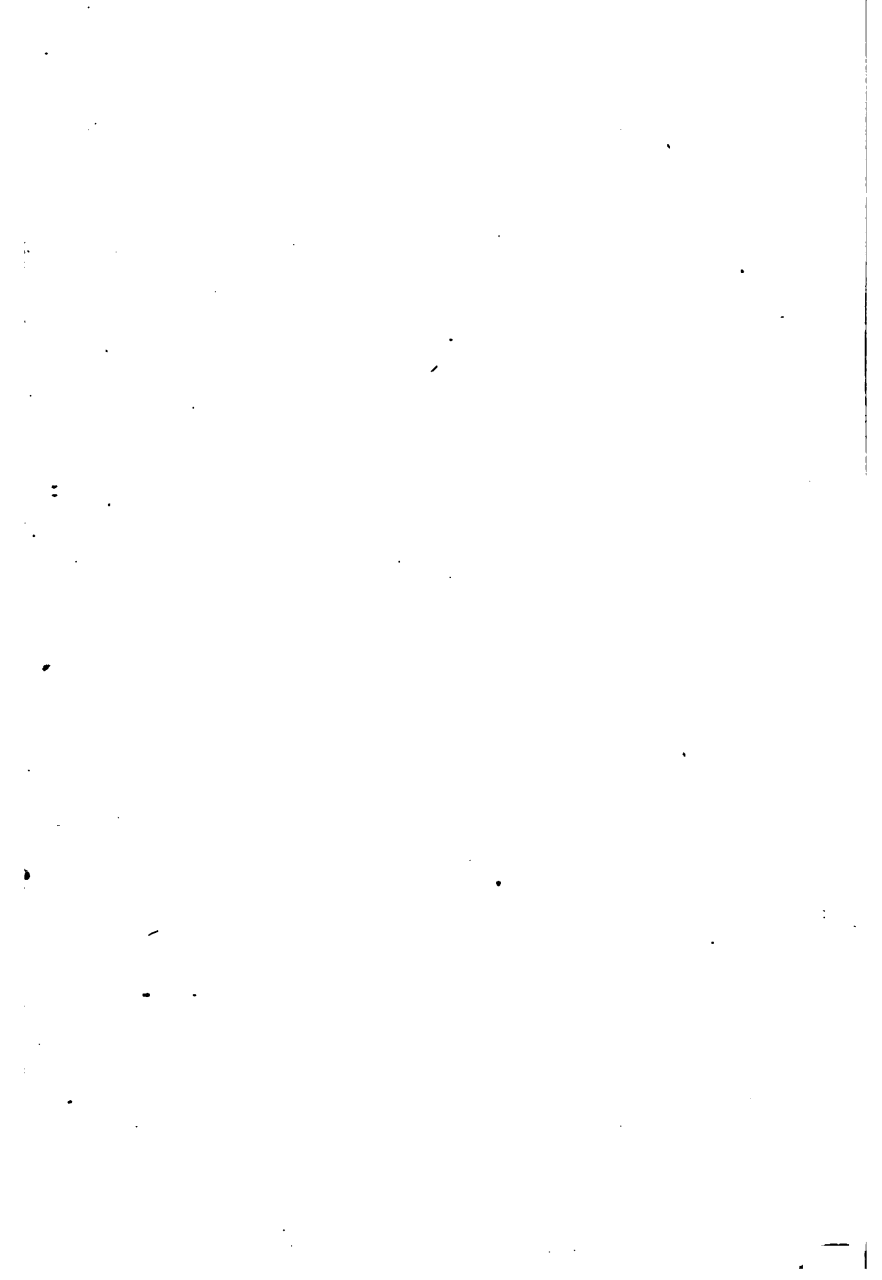
Dinner, 5 P. M. Roast mutton or beef, steak, chop, or dry mutton-cutlets. Vinegar, tomato sauce, currant jelly, horse-radish, potatoes, and vegetables, all allowed. Rice pudding, stewed or roast apples. A small bottle of Bass or a pint of beer, or two glasses of sherry, port, or claret and water. A glass of port wine soon after dinner, and oranges occasionally. A cup of tea in the course of the evening allowed.

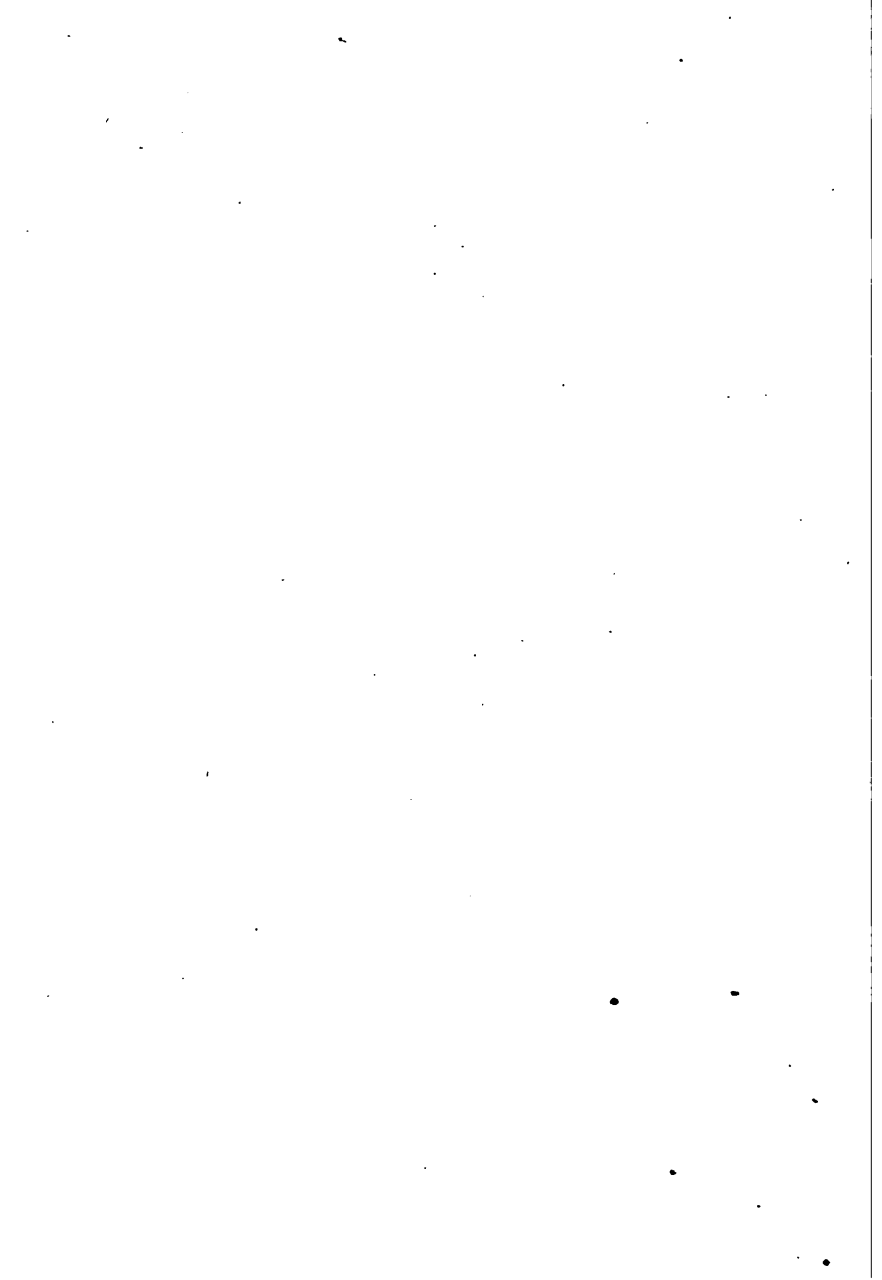
9.30. P. M. A few minutes' dumb bells, tepid sponging of the whole body, good rub down, bed at 10 P. M.

(2) If dinner is at 2 o'clock, the afternoon row should commence at 5.

Supper the same as breakfast, at 8 o'clock. Half a pint of beer or tea.

Thirst at other times in the day to be relieved by water.





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